International Finance

Lecture 10 - The Dornbusch overshooting model

Chapter 23

Introduction

In a very influential paper Dornbusch (1976) developed a model to explain exchange rate overshooting, a phenomenon which occurs when, during the adjustment to new equilibrium, exchange rates temporarily overshoot their long run values. This can explain what appears to be excessive volatility in exchange rates. The novel feature of the model is the explicit treatment of differential speeds of adjustment in the goods and asset markets. Asset markets adjust quickly, almost instantaneously to shocks, while goods markets are sluggish, and adjustment is slow.

The model

The model combines the long run features of the monetary approach with the IS/LM model in the open economy. We shall use a simplified diagrammatic approach, mainly due to Copland (2000), but be warned. The model is very complicated. We shall use lots of tools from our toolbox.

We shall be interested in the effects of an unexpected monetary expansion on interest rates, the price level and most importantly, on exchange rates. We will proceed by first setting the scene with a model in long run equilibrium. Then we will subject our model to a surprise money supply increase. As is usual in these types of models, we shall start by examining the long run effects of the money shock, and then look the impact effects, and how the economy gets from the short run to the long run.

Some Assumptions

1. Small open economy. Take $P^*$ and $i^*$ as given.
2. Flexible c-rates.
3. PPP holds in long run. $P = eP^*$. In the short run deviations from PPP can occur.
4. Real exchange rate $R = eP^*/P$ is rate that keeps the current account in balance.
5. Perfect capital mobility, with expectations of exchange rate changes, so uncovered interest arbitrage parity holds.
6. In the long run income is at its full employment level.

Asset market equilibrium

U.I.A.P. $i = i^* + xa$, where $xa$ is the expected appreciation of the foreign currency

In the long run the actual exchange rate will be the same as expected exchange rate.

Therefore in the long run $xa = 0$

The expected e-rate is the one that maintains PPP.

Point A on the diagram.

In the short run interest rates can diverge from world interest rates, but only if $xa$ is not zero.
If domestic interest rates fall, U.I.A.P requires that $x_a$ is negative (domestic currency is expected to appreciate), but if the expected long run exchange rate is unchanged the currency will immediately depreciate so that it appreciate later to fulfill investors expectations. Point b in the diagram.

The relationship between the interest rate and the e-rate is shown as AM. AM is drawn for a given expected exchange rate.

The exchange rate then appreciates back to its long run value.

A change in the expected e-rate shifts the AM curve until it cuts the $x_a = 0$ line at the new expected e-rate.
The real exchange rate and PPP

The 0R line shows the real exchange rate \( R = \frac{eP^*}{P} \) that maintains current account balance. In the long run the economy always returns to this line, and PPP is maintained.

Below the 0R the current account is in surplus, as the $ is over competitive. There will be pressure for prices to rise.

Prices are sticky in this model, which means they do not change immediately to restore equilibrium in the goods market. There may be costs to changing prices, long term contracts, labor market rigidities etc. But in the end, prices adjust.
The IS curve is standard for an open economy. We shall only be interested in monetary shocks so we will take autonomous investment, fiscal policy etc as given.

Recall that change in the real exchange rate, R, shifts the IS curve. As R increases, the US is more competitive and the IS curve shifts to the right.

The LM curve is also standard, but we are going to allow prices to change, so the position of the LM curve is determined by the real money supply $M/P$. Now the LM curve shifts down if there is an increase in nominal money, M, or a decrease in the price level, P.

In the long run real income is fixed at its full employment level.

In the short run income can change, but when $Y$ is above its long run level there will be pressure for prices to increase. As that happens income will return to its long run level.
The starting position

Y at full employment

Interest rates at world interest rates, $x_a = 0$.

E-rate at PPP level, given domestic prices, which are stable because the goods market clears.

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(a) Asset market equilibrium.

(b) IS/LM

(c) PPP

$\bar{Y}$ is full employment income.

$\bar{R}$ is the real exchange rate consistent with current account balance.

Long run equilibrium at points A, C, and F.
The Dornbusch Model

(a) Asset market equilibrium.

\[ i^* \]

\[ x_a > 0 \]

\[ x_a < 0 \]

\[ \bar{E}_0 \]

\[ E \]

(b) IS/LM

\[ \bar{E}_0 \]

\[ \bar{Y} \]

\[ P \]

\[ P_0 \]

\[ \bar{R} = \frac{eP^*_R}{P} \]

\[ \bar{Y} \] is full employment income
\[ \bar{R} \] is the real exchange rate consistent with current account balance.

Long-run equilibrium at points A, C, and F.
The Dornbusch Model

(a) Asset market equilibrium.

(b) IS/LM

(c) P.P.P

Money supply increase

Impact effects

MP, expected $e \uparrow$

LM shifts.

$i \downarrow > x_a \downarrow$

$e$ rate overshoots to $e_2$

to clear asset market.

Transition. As $P$ rises and $e \uparrow$ the real $x_a$ rate is restored.

LM and IS shift back to original positions.
The Dornbush diagram

The OR line is the PPP line introduced earlier.

The AA curve shows the combinations in \( P \) and \( e \) that clear the asset markets. For any expected exchange rate, and money supply, a rise in \( P \) requires a rise in the interest rate to clear the money market. If \( i \) is above \( i^* \), \( x \) must be positive. Therefore the exchange rate must rise, so investors can get the expected $ depreciation. So \( P \) is negatively related to the exchange rate.

A rise in the money supply shifts the AA curve to the right because it increases the expected exchange rate.

A money supply increase (shock) shifts the AA curve to the right. Prices are sticky, causing the e-rate to overshoot its long-run value. As prices adjust upward the e-rate appreciate.
The time path of prices, e-rate and interest rates.

The money supply unexpectedly rises at to. e and i immediately jump to clear the asset markets. Prices then start to adjust long run levels.
Exchange rate overshooting

This is a direct consequence of the stickiness in prices. If prices were not sticky the economy would move immediately to its long run position with higher prices. The exchange rate has to move a lot to compensate for the fact that prices do not change.

Implications

The Dornbusch model offers valuable insights into the functioning of a flexible exchange rate system. Two observed phenomena are explained. The first is the overshooting of exchange rates, resulting in exchange rate volatility. The second is that, counter to the predictions of traditional models, this model predicts that the exchange rate will appreciate at the same time as prices are rising.

Also in the real economy is affected by monetary shocks in the short run (which remember could be years). Consider a fall in the money supply. The model predicts a fall in income (and unemployment) during the adjustment period. The adverse affects on income are amplified by the overshooting of the exchange rate.